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Attention: Candice Teichert

Subject: Delivery of Interim Report for the "Barite Hill/Nevada Goldfields site."

Dear Ms. Tiechert:

Enclosed find the interim report for the Barite Hill/Nevada Goldfields site. This delivery consists of the report presented in three sections: Wetlands Analysis, Black-and-White Infrared Imagery, and Fracture Trace Analysis.

This is a partial delivery for this project. If you have any questions, please contact me at (702) 685-8326 or Ed Evanson at (702) 524-4389.

Very truly yours,

Robert A Sheets
Senior Graphics Artist
Lockheed Martin
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June 2012

AERIAL PHOTOGRAPHIC ANALYSIS OF BARITE HILL/NEVADA GOLDFIELDS

McCormick, South Carolina

Interim Report

by

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Contract No. GS-35F-4550G

Task Order Contracting Officer Representative

H. C. Seaver
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NOTICE

As an interim product, this document has not gone through the complete EPA quality assurance cycle. Any errors that are discovered during preparation of the final report will be corrected therein.

METHODOLOGY

This report was prepared using a standard methodology that includes the following steps:

- data identification and acquisition,
- photographic analysis and interpretation, and
- graphics and text preparation.

These steps are described below. Subsections also address details related to specific kinds of analyses that may be required to identify environmental features such as surface drainage and wetland. All operational steps and processes used to perform this work (including data identification and acquisition, photographic analysis and interpretation, and graphics and text preparation) adhere to strict QA/QC guidelines and standard operating procedures (SOPs).

Data identification and acquisition included a search of government and commercial sources of historical aerial film for the study area. Photographs with optimal spatial and temporal resolution and image quality were identified for acquisition. In addition, U.S. Geological Survey (USGS) topographic maps were obtained to show the study area location and to provide geographic and topographic context.

To conduct this analysis, the analyst examined diapositives (transparencies) of historical aerial photographs showing the study area. Diapositives are most often used for analysis instead of prints because the diapositives have superior photographic resolution. They show minute details of significant environmental features that may not be discernible on a paper print.

A photographic analyst uses a stereoscope to view adjacent, overlapping pairs of diapositives on a backlit light table. In most cases, the stereoscope is capable of various magnifications up to 60 power. Stereoscopic viewing involves using the principle of parallax (observing a feature from slightly different positions) to observe a three-dimensional representation of the area of interest. The stereoscope enhances the photo interpretation process by allowing the analyst to observe vertical as well as horizontal spatial relationships of natural and cultural features.

The process of photographic analysis involves the visual examination and comparison of many components of the photographic image. These components include shadow, tone, color, texture, shape, size, pattern, and landscape context of individual elements of a photograph. The photo analyst identifies objects, features, and "signatures" associated with specific environmental conditions or events. The term "signature" refers to a combination of components or characteristics that indicate a specific object, condition, or pattern of environmental significance. The academic and professional training, photo interpretation experience gained through repetitive observations of similar features or activities, and deductive logic of the analyst as well as background information from collateral sources (e.g., site maps, geologic reports, soil surveys) are critical factors employed in the photographic analysis.

The analyst records the results of the analysis by using a standard set of annotations and terminology to identify objects and features observed on the diapositives. Significant findings are annotated on overlays attached to the photographic or computer-reproduced prints in the report and discussed in the accompanying text. Annotations that are self-explanatory may not be discussed in the text. The annotations are defined in the legend that accompanies each print and in the text when first used.

Objects and features are identified in the graphics and text according to the analyst's degree of confidence in the evidence. A distinction is made between certain, probable, and possible identifications. When the analyst believes the identification is unmistakable (certain), no qualifier is used. Probable is used when a limited number of discernible characteristics allow the analyst to be reasonably sure of a particular identification. Possible is used when only a few characteristics are discernible, and the analyst can only infer an identification.

The prints in this report have been reproduced, either by photographic or computer methods, from the original film. Reproductions are made from the original film and may be either contact (the same size) prints or enlargements, depending on the scale of the original film. Any computer-produced prints used in this report are generated from scans of the film at approximately 1,300 dots per inch (dpi) and printed at 720 dpi. Although the reproductions allow effective display of the interpretive annotations, they may have less photographic resolution than the original film. Therefore, some of the objects and features identified in the original image and described in the text may not be as clearly discernible on the prints in this report.

Study area boundaries shown in this report were determined from aerial photographs or collateral data and do not necessarily denote legal property lines or ownership.

Digital Diapositives

Some film vendors no longer supply analog film products (e.g., diapositive transparencies) to their customers. Digital files, created by scanning the original analog film products, are provided. The digital file, a representation of an original analog film product, can be analyzed either by computer viewing techniques or by creating a secondary diapositive from the digital file and viewing the secondary diapositve on a light table. The result of this process of converting an analog diapositive image to a digital file may be a reduction in the photographic resolution. A potential consequence of this in the realm of aerial photographic analysis is a lower confidence in the identification of features or conditions of environmental significance. For example, what may have been identified with certainty as "a drum" on the analog version of the diapositive may, on the digital diapositive, only be determined to be "a probable drum."

Color Infrared Photographs

Some photographs used for this analysis were made from color infrared film. Normal color film records reflected energy in the blue, green, and red portions of the electromagnetic spectrum. Color infrared film differs in that it is sensitive not only to reflected blue, green, and red energy, but also to reflected energy in the infrared portions of the electromagnetic spectrum; however, the blue energy is filtered out and only the green, red, and infrared energy is recorded. When color infrared film is processed, it displays "false" colors that do not correspond with the true colors of the features photographed. For example, features that are highly reflective in the infrared portion of the spectrum, such as healthy vegetation, appear red to magenta on color infrared film. The false color displayed by a feature is produced in accordance with the proportions of green, red, and infrared energy it reflects. These proportions are referred to as the "spectral reflectance characteristics" of the feature. To interpret the true color of a particular feature accurately from color infrared film, a knowledge of the spectral reflectance characteristics of that feature is required. This information is not readily available for the majority of features identified in this report. Therefore, unless otherwise indicated, no attempt has been made to interpret the true colors of the features identified on the color infrared film analyzed for this report.

Wetland Analysis

The most general type of wetland analysis involves differentiating wetland and nonwetland areas. An analyst utilizes aerial photographs, soil surveys, hydric soils data, National Wetland Survey maps, and other available data to identify wetland boundaries and drainage networks within a study area. More detailed analyses are conducted using the Cowardin Classification System (Cowardin 1979) to provide information regarding vegetation types and hydrologic regimes. Analyses of photography from several years can be compiled to assess changes in wetland areas and measurements can be conducted to quantify results. Field checking of final products can confirm and refine mapping results and aid in compliance with jurisdictional and legal requirements. Results of wetland analysis are presented on clear acetate overlays attached to photographs or USGS topographic maps.

WETLAND ANALYSIS

The wetland analysis performed for this report is based on historical aerial photographic interpretation and collateral data including wetland GIS data sets and information from National Land Cover Database soil surveys, GIS data sets and wetland information from the South Carolina Department of Natural Resources, wetland GIS data sets and information from US Fish and Wildlife Service National Wetlands Inventory, and GIS soil survey data sets from the USDA/NRCS - Natinal Soil Survey Center.

Findings of the wetland analysis reveal the wetlands are primarily forested and riparian. The wetlands within the study area or restricted to the natural creek bottoms that carry drainage away from the site. The forest land adjacent to the site has harvested over the years but these has been no significant development to alter the general natural drainage patterns around the site. The unchanged natural drainage has allowed the natural riparian wetland adjacent to the site to remain generally not significantly enlarged or contracted. The extent of wetlands adjacent to the site does not appear to have been significantly decreased as a consequence of the mining activity that occured from 1994 through 1999. These adjacent wetlands do however receive surface runoff escaping the mine site and impoundments that may potentially transport mine waste pollutants or sediments into the natural drainage system.

1959 - Pre Barite Hill Mine

The 1959 photograph shows the condition of the site prior to the establishment of the Barite Hill mining operations. The probable wetlands adjacent to the site are restricted to the natural creek bottoms.

1994 - Barite Hill Mine Site

Photo analysis determined that the presence of probable riparian wetlands remain at the natural creek bottoms as observed on the 1959 photo after the establishment of Barite Hill mining operations. Pollutants can be potentially transported by rainwater runoff. These wetlands may be threatened by potential contamination.

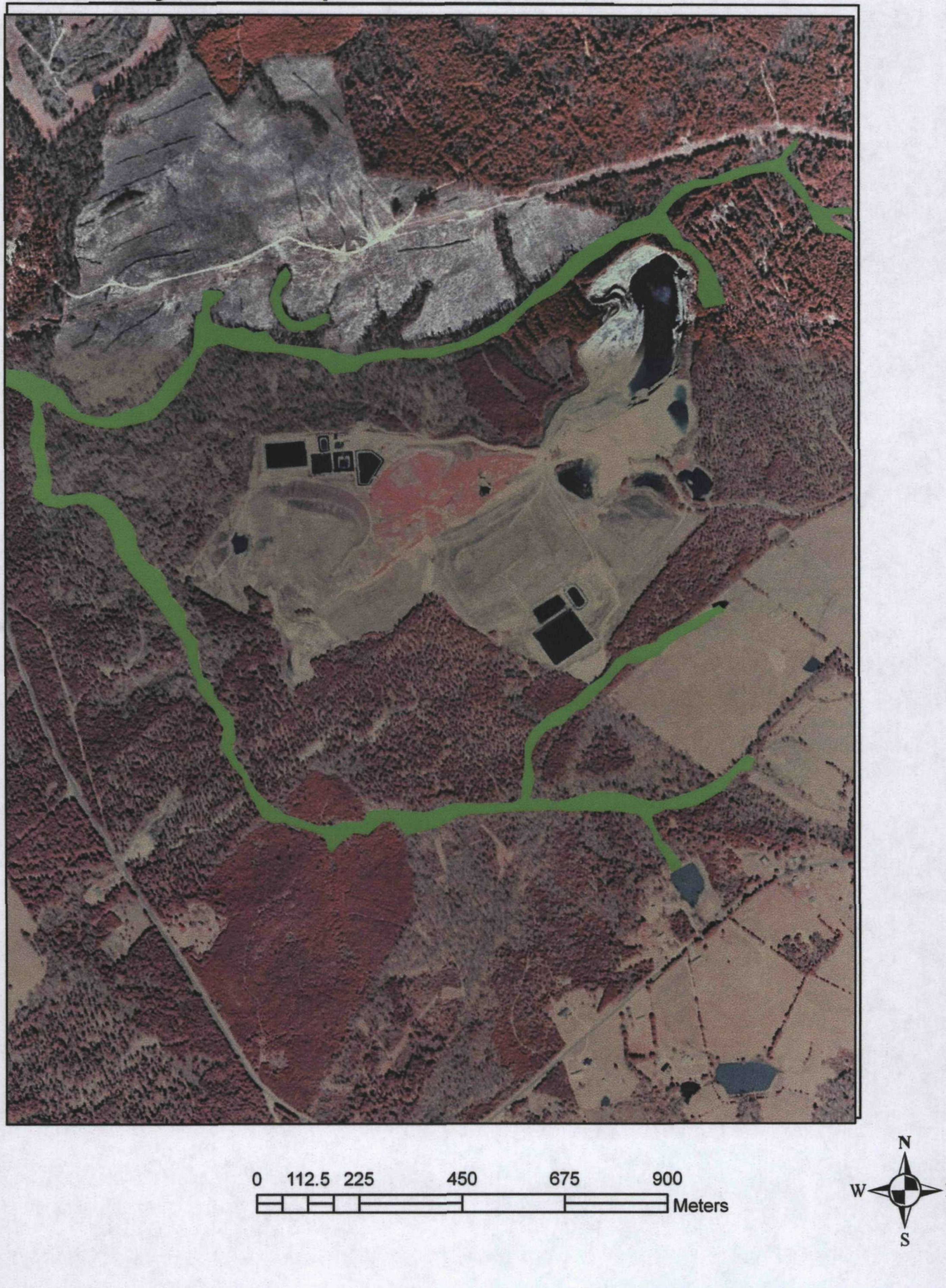
1999 - Barite Hill Mine Site

Photo analysis determined that the presence of probable riparian wetlands remain at the natural creek bottoms as observed on the 1994 photo. There has been no significant change in the probable wetlands from 1994 to 1999.

Pre Barite Hill Mine Site
Adjacent Riparian Wetland, 1959

Barite Hill Mine Site
Adjacent Riparian Wetland, 1994

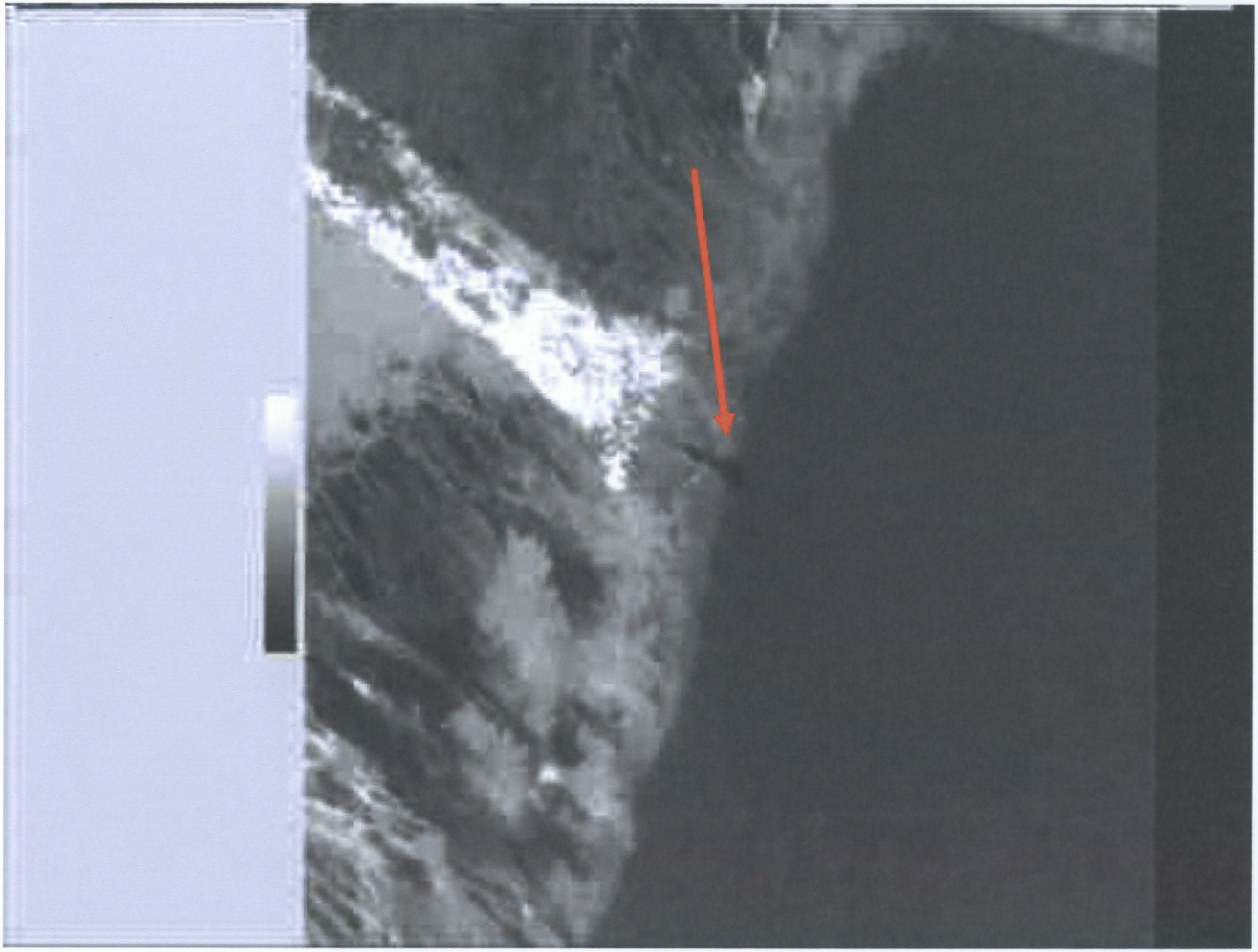
Barite Hill Mine Site
Adjacent Riparian Wetland, 1999



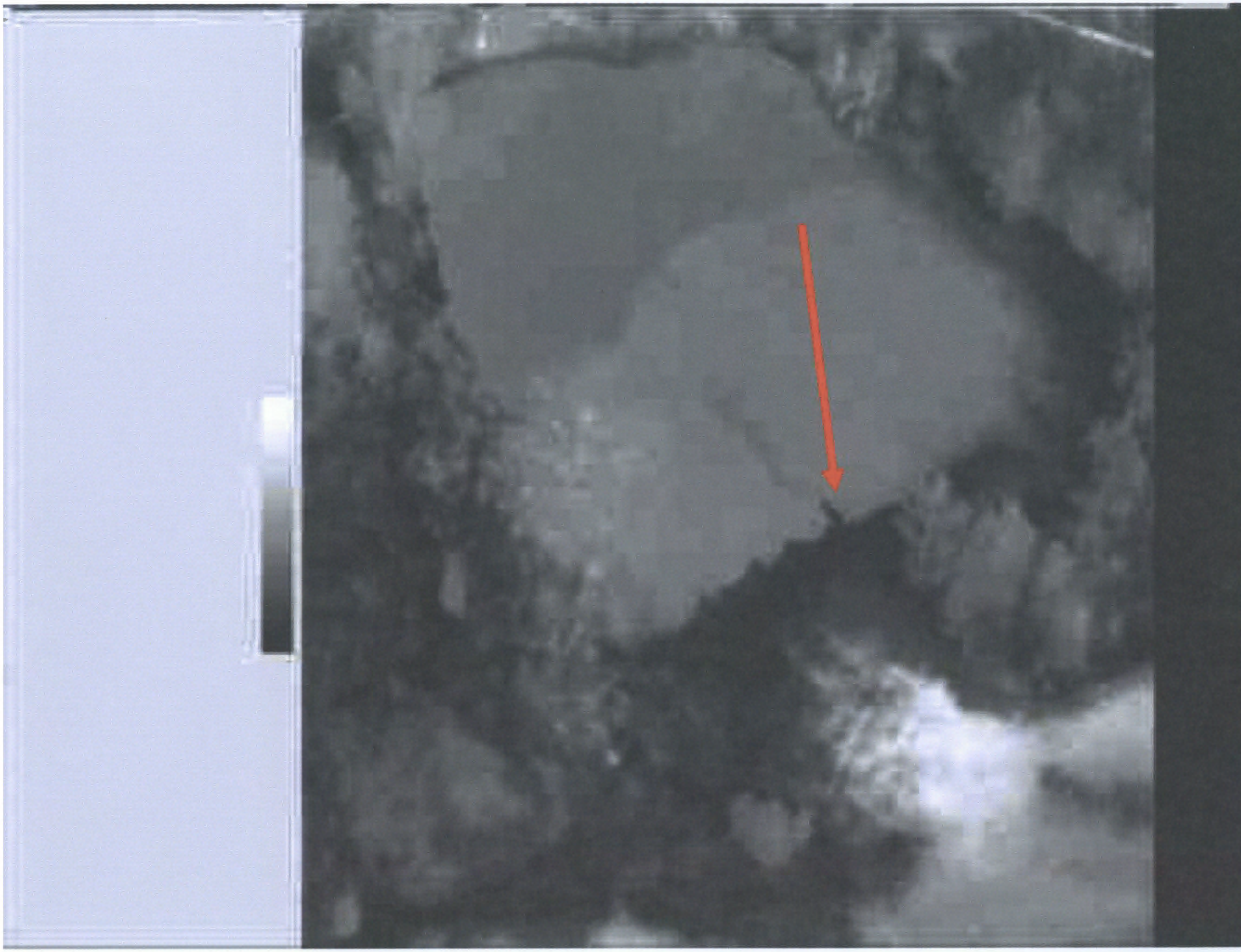
BLACK-AND-WHITE INFRARED IMAGERY

The images used for this analysis were made from black-and-white infrared scanner data. The equipment used during this inspection was the Inframetrics Thermacam PM 390. This instrument is a focal plane array thermal imaging system with temperature measurement capabilities of -14 F to 2732 F. Accuracy, as stated by the manufacturer, is +/- 2% or 2 degrees C. The sensitivity is < 0.18 F @ 86. Normal color film records reflected energy in the blue, green, and red portions of the electromagnetic spectrum. Black-and-white infrared scanner data differs in that it is sensitive to reflected energy in the infrared portions of the electromagnetic spectrum. For example, features that are highly reflective in the infrared portion of the spectrum, such as healthy vegetation, appear in shades of gray on the black-and-white infrared image. These portions are referred to as the "spectral reflectance characteristics" of the feature. No interpretation of the true color of a particular feature can accurately be made from black-and-white infrared image, and a knowledge of the spectral reflectance characteristics of that feature is required. This information is not readily available for the majority of features identified in this report. Therefore, unless otherwise indicated, no attempt has been made to interpret the features identified on the black-and-white infrared images.

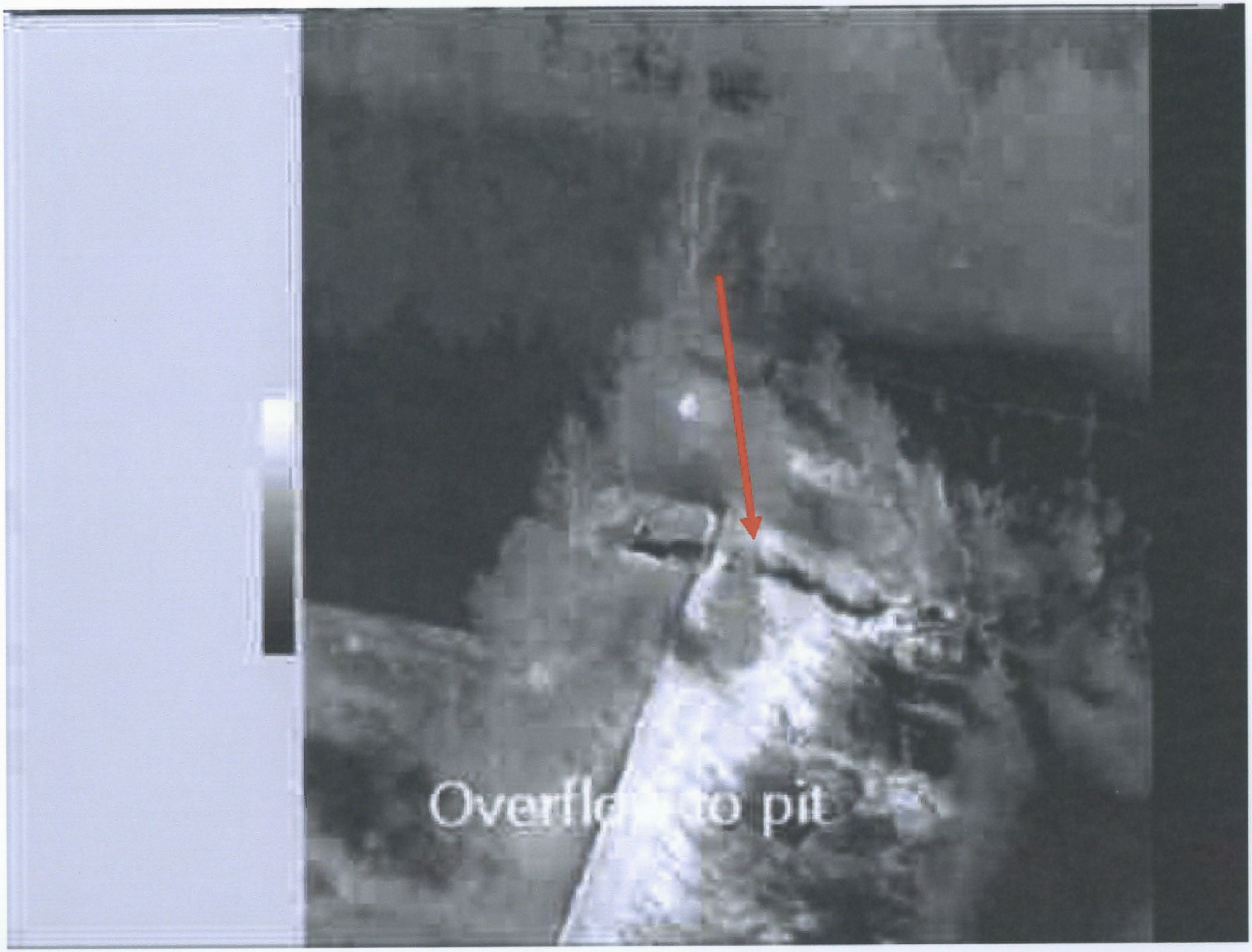

Pond 1
2
Barite Hill Mine Superfund Site
5
4
3



Drainage into Pond labled #2



Drainage into Pond labled #4



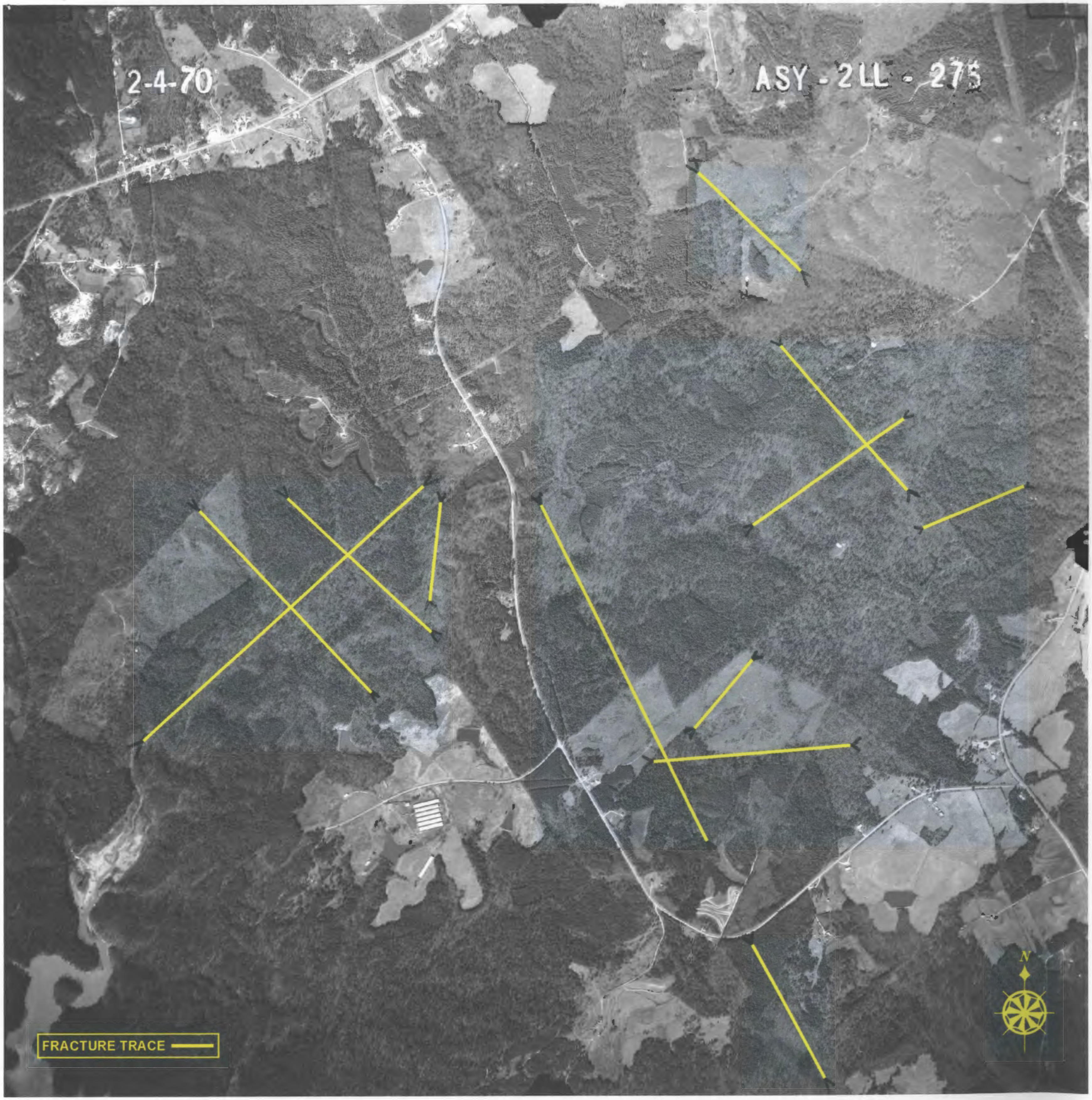
Drainage into Pond labled #5 pit.

FRACTURE TRACE ANALYSIS

Fracture trace analysis is the technique of using aerial imagery for locating fracture traces or geologic lineaments on the earth's surface based on the photo-geologic signatures such as soil-tonal variations and vegetational and topographic alignments. Fracture traces are considered to be the surface expressions of vertical-to-near-vertical zones of fracture concentration in bedrock (see Methodology section). Fracture traces indicate the location of fracture zones that may provide avenues for increased groundwater flow and, therefore, areas of concentrated contaminant collection and flow.

The fracture trace analysis results are shown on photograph dated February 4, 1970. A total of twelve fracture traces were identified in the vicinity of the Barite Hill site.

Caution, however, should be exercised if the fracture traces identified in this analysis and annotated on the 1970 photograph are to be used for determining the placement of groundwater monitoring wells. Differences of just a few meters can determine whether or not a well is located on a given fracture trace.



2-4-70
ASY - 2LL - 275
N
FRACTURE TRACE